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THALICTRUM AMETRUM GREENE: AN INTERESTING NOMENCLATURAL CASE

Leon Croizat

The validity of *Thalictrum polycarpum* S. Wats. against the earlier *T. polycarpum* Loret, and the later *T. ametrum* Greene has been affirmed by Wheeler (Rhodora 40: 318–320. 1938) in a discussion which is exceedingly interesting under the standpoint of nomenclature. In this discussion Wheeler raises two issues, first, whether the parenthetic author must be indicated in every case; second, whether an earlier name can be duplicated, and if so under what conditions.

Lack of space makes it necessary for me to discuss here only one of these issues. Accordingly, I shall discuss the second, which is more important.

The first printed mention of *Thalictrum polycarpum* occurs in a paper by Loret (Bull. Soc. Bot. France 6: 16. 1859). To spare the reader the necessity of wading through Loret's stiff French, but doing violence to accepted bibliographical standards, I shall quote here as if in the original my own translation of this publication. Loret states: "I have collected in a hedge at Barcellonette (Basses-Alpes) at the end of July 1851 an interesting *Thalictrum* which is quite noteworthy on account of its short-ovoid carpels, 9–12 to 14 being borne upon a single receptacle. This plant is close to, but differs appreciably from *T. Jacquinianum* Koch and *T. expansum* Jord. I believe this *Thalictrum* to be a new species, but, fearing to augment the confusion already prevalent in this genus, I merely bring this plant to the attention of the botanists who may have the opportunity of collecting at Barcellonette, hoping on my part to see this plant again on the spot. If I were to be allowed to give this plant a name, I would gladly call it *T. polycarpum* or, better still, *T. multiflorum* (S'il m'etait réservé de lui imposer un nom, je lui donnerais volontier celui de *Th. polycarpum* ou mieux *multiflorum*)."

The binomials of Loret have been disregarded by practically every author, with the exception of Lecoyer. In his monograph of *Thalictrum* (Bull. Soc. Bot. Belg. 24: 78–324. 1885), Lecoyer treats *T. polycarpum* as a synonym of *T. multiflorum* (op. cit., 304), which he places in the synonymy of *T. minus* L. Lecoyer adds (*op. cit.*, 297) that *T. multiflorum* is "une forme non décrite" of *T. minus*, believing *T. multiflorum* to be a *nomen nudum* or a *nomen seminudum* which has *T. polycarpum* as its synonym.

Wheeler is of the opinion, on the contrary, that *T. polycarpum* and *T. multiflorum* "is an illegitimate name of the type known as a *nomen provisorium*," without specifying which one of these two binomials he interprets as the provisional name. I do not believe it necessary to argue the status of these binomials at this point, because the matter has little immediate importance. The impor-

Madroño, Vol. 7, pp. 1–32. January 28, 1943.

tant side of Wheeler's interpretation is in his statement that: "Provisional names are not only illegitimate but are not validly published. *Since they are not validly published they cannot as earlier homonyms, invalidate a later name*" (italics mine).

This statement contains an unmitigated fallacy. *Thalictrum polycarpum* is illegitimate because its duplicates *T. minus* L. (Art. 16, Art. 60[1] Amsterdam Code), and is invalid, in addition, at least because it is published as a synonym of *T. multiflorum* (Art. 40). Article 61 in the current Rules states: "Even if the earlier homonym is illegitimate, or is generally treated as a synonym on taxonomic grounds, the later homonym must be rejected." This is clear enough: *T. polycarpum* Loret is not only illegitimate and invalid but has been treated as a synonym of *T. minus* L. on taxonomic grounds by Lecoyer. Obviously, *T. polycarpum* Loret, 1859, as an earlier homonym renders illegitimate *T. polycarpum* S. Wats., 1879. The text of Article 61 and the status of the binomials both of Loret and Watson precisely and absolutely contradict Wheeler's affirmations.

Since Wheeler's error rests upon assumptions which are unfortunately widespread, it is advisable to add here a few words of comment. Many are the taxonomists who believe that a name which is not "valid" may be "ignored." This belief involves a fundamental confusion between two different concepts, which can easily be illustrated by an example. Let us suppose that John Doe publishes in 1940 *Planta una* without a Latin description. This binomial is invalid, because Article 38 of the Amsterdam Code requires a Latin diagnosis for a valid publication. Accordingly, Jack Roe can freely use the type specimen of *P. una* and propose on it in 1942 a new binomial, *P. quaevis*. Roe can do this because the publication of Doe does not "exist" as valid nomenclature on account of the lack of a Latin diagnosis. Of course, Roe, if he so wishes, can honor the earlier invalid binomial proposed by Doe, effectively publishing *P. una* with a Latin diagnosis. In this case (Art. 48), the species will be known as *P. una* J. Doe *in* (or *ex*) J. Roe.

An entirely different state of affairs obtains if J. Roe attempts to publish in 1942 a new species, naming it *P. una* and basing it upon a type specimen other than the one originally used by J. Doe in 1940 for his *P. una*. *Such a duplication is expressly forbidden by Article 61, as it has been seen.* Under the Vienna Code (1905) and Bruxelles Code (1910) it was not permitted to reject a well known name, "Because of the existence of an earlier homonym which is universally regarded as non-valid or for any other motive either contestable or of little import" (Art. 50, Vienna and Bruxelles Codes). The motives behind this Article were lofty, no doubt, but its practical application led to countless controversies and abuses, because the generality embodied in the Article was not accompanied by an elucidation of what was meant as an

homonym "universally regarded as non-valid," and what were "motives contestable or of little import." Naturally, everybody thought of his own motives as being true and relevant, and of those of his opponents as "contestable or of little import." To remedy this situation, the text now embodied by Article 61 was approved by the Cambridge Congress of 1930. Space forbids my entering into details, but I may at least point out that Miss L. Green, who is well informed on everything that was proposed and voted upon at Cambridge, states in her authoritative commentary on nomenclature (Emp. For. Jour. 10: 68. 1931) that: *"All* later homonyms should be rejected even if the earlier homonym is not an accepted name" (italics in Miss Green's text).

Much confusion reigns as to the meaning of *invalidity* as distinct from *illegitimacy* in the sense of the Rules, for the very good reason that the Rules themselves use these terms in a loose and contradictory manner. Examples of this confusion are rife in the Amsterdam Code, and one at least may be cited here. Article 2 defines as *illegitimate,* names or forms contrary to an Article, and states that such names cannot be maintained. Article 63, on its part, prescribes that the name of a taxonomic group "must be rejected when its application is uncertain". Since such a name [*nomen dubium*] "must be rejected," it stands to reason that this name is *illegitimate* under the definition given in Article 2. However, Recommendation xxxvii which immediately follows Article 63 authorizes the certification of a *nomen dubium* following an adequate taxonomic study made on the basis of new evidence (Art. 17, Rec. iii, Rec. xxxvii). Thus, Article 63 errs in stating that a *nomen dubium* "must be rejected," branding it implicitly as *illegitimate.* Such a name is merely *invalid,* proof of this being the fact that this name can be used legitimately under certification.

Since the Rules themselves are not clear as to the proper use of *validity* and *legitimacy,* it would be useless to argue here Wheeler's contention that a *nomen provisorium* is both invalid and illegitimate. Sooner or later, a fundamental debate is bound to take place in a Botanical Congress about these concepts. Meanwhile, I may contribute here a brief comment as to the meaning of *validity* and *illegitimacy,* once again using an example.

As it is well known, the law orders that a testament must conform with certain specified requirements, a part of the estate of the deceaesed going automatically to certain parties by reason of their being related with the author of the will. If the will is drawn *against* the law and, for instance, the estate is distributed in a manner which is forbidden by law, the will is *illegitimate,* and as such *it cannot be maintained.* A will, conversely, may be drawn *according to the law,* but before it takes effect it must go through the procedure of probating, and is not *valid* until probated. *The probating of a will is exactly the same procedure as the valid publica-*

tion of a taxonomic name. Neither a will nor a taxonomic name is *valid* until it is probated or published according to the laws of the land or the Articles of the Rules of Nomenclature. Naturally, neither a will nor a taxonomic name is *legitimate* if it violates the law of the land or the Articles. A will that violates the law and a name that violates an Article may be unimpeachable as to form, but can neither be probated nor maintained *because they are faulty as to substance.* This, in a nutshell, is the distinction that can briefly be made here between the concept of *validity* and that of *legitimacy.* It is high time that the Articles be carefully revised and amended in order that they be purged of pointless and confusing abuses of the proper terms ultimately leading to a flood of mistaken comments in the literature.

The following synonymy is in order:

THALICTRUM AMETRUM Greene in Muhlenbergia 5: 129. 1909. *T. polycarpum* S. Wats. in Proc. Am. Acad. Sc. 14: 288. 1879; Jepson, Fl. Calif. 1: 530. 1922; Munz, Man. South. Calif. Bot., 173. 1935; Wheeler in Rhodora 40: 318–320. 1938. *Non Loret.*

Arnold Arboretum, Harvard University,
Jamaica Plain, Mass.,
March 3, 1942.

UNA NUEVA ESPECIE DE PINUS MEXICANO

MAXIMINO MARTÍNEZ

Pinus Douglasiana sp. nov. Arbor 20 m. alta; diametros 30–50 cm.; coma densa rotundata. Cortex leviter scabris, rubescens, 2 cm. crassus, squamatus. Rami expansa; ramuli brunneo rubescentis, valde scabri. Folia 5, triangularia, crassa, rectiuscula, pungentia, 25–33 cm. longa, marginibus denso serrulato, claro virore vel galbinus coloris, fulgentia, intus glauco in folia juniora. Hypodermo biformis usque endodermo penetrabilis, chlorenquima partitus; fascies-exterius endodermi incrassatus. Ductus resiniferi 3 in parenchymatis parte siti; fasces fibrovasculares 2, approximati, patentibus. Vaginae persistentes, 20–30 mm. longae, squamatae, castanei rubescens, dein obscuro castanei. Strobilis junioribus erectis violaceo fuscus, subterminalibus, oblongis attenuatis, obtusis; squamae crassae, apex expansus vel erectus. Strobili maturi ovoidei, leviter asymetricus, deflexi, paulum incurvati, in apex attenuati, fusco rubescens coloris, cadivus, 7.5–10.5 cm. longis, terni vel quini. Pedunculi 12 mm. incurvi ad strobili adnatus. Squamae 28–30 mm. longae, 15 mm. latae; apex irregulariter, obtuso vel rotundato; umbo subquadrangulo vel polyangulatus, carina transversa patente, carina longitudinali depressa, fere complanata in basis strobili. Cuspide complanata, paulum patente, mucro cadivo. Semina obscura fere ovoidea, 5 mm. longa, ala 25 mm. longa 8 mm. lata, brunnea. Lignum mollis, album; resina fere nulla.

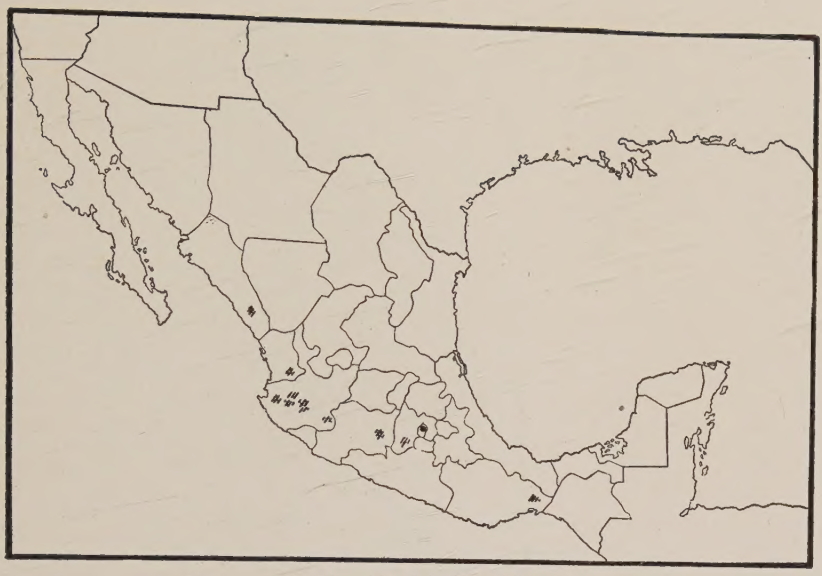

FIG. 1. Distribución del *Pinus Douglasiana*.

Typum in Instituto de Biologia, Mexico; isotypi in Arnold Arboretum, Harvard University, Jamaica Plain, Massachusetts, United States National Herbarium, Washington, D. C.

He tenido a la vista ejemplares procedentes de: SINALOA. Batel, Concordia; Santa Lucía, Concordia, "pino real"; Cerro de Tecoripa, Sierra del Rosario; límites de Sonora y Chihuahua; Potrero de Bejarano, Badiraguato; Rosario. NAYARIT. Juanácata, Jala, "pinabete." JALISCO. San Martín Hidalgo; Tecolotlán; Cerca de Cuale, a 20 km. al E. de Bahía de Banderas; Ameca, "pino blanco"; Atengo, "pino blanco o pino hayarín"; Soyatlán, a 2200 m., "pino blanco"; Concepción de Buenos Aires. MICHOACAN. Tiripitío. OAXACA. El Barrio; Santiago Tlaxoyaltepec. MEXICO. Cuautepec, Sultepec.

Es árbol de unos 20 metros de altura, por 30 a 50 cm. de diámetro a la altura del pecho; de copa redondeada y densa; con la corteza algo áspera de 2 cm. de espesor aproximadamente, rojiza y escamosa, dividida en placas irregulares. Ramas extendidas, agrupadas en la parte superior del tronco. Ramillas morenas con tinte rojizo y muy ásperas, debido a la persistencia de la base de las brácteas, las cuales son anchas, salientes y contiguas. Se descaman fácilmente. Hojas en grupos de 5, triangulares, gruesas, casi derechas, y agudas, de 25 a 33 cm. de largo, con los bordes finamente aserrados, de color verde claro, algo amarillento, brillantes, con tinte glauco en las caras interiores, solamente visible en las hojas tiernas. El hipodermo es biforme, muy grueso con 5 capas de células desiguales e irregularmente colocadas, y presenta entrantes, a veces dobles, que llegan al endodermo seccionando el

clorénquima; las paredes exteriores de las células endodérmicas son muy engrosadas. Tienen dos fasces vasculares contiguos, bien distintos, rodeados arriba y abajo de células de refuerzo; los canales resiníferos son medios y en número de tres. Las vainas son persistentes, de 20 a 30 mm., escamosas abajo y anilladas arriba, de color castaño rojizo al principio y castaño obscuro después. Las yemas son cónicas, de color naranjado rojizo. Los conillos son moreno violáceos, erguidos, oblongos, subterminales, algo atenuados en ambas extremidades, romos, generalmente en grupos de tres, con escamas gruesas, armadas de puntas extendidas o dirigidas hacia el ápice. Conos largamente ovoides, algo asimétricos, reflejados, ligeramente encorvados, atenuados hacia el ápice, de color moreno rojizo, opacos, caedizos, de 7.5 a 10.5 cm. Se presentan en grupos de 3 a 5, sobre pedúnculos de unos 12 mm., siempre encorvados, quedando con el cono cuando éste cae. Escamas de unos 20 a 30 mm. de largo, por 15 de ancho, de ápice irregular, obtuso o redondeado, umbo irregularmente cuadrangular o poligonal, rugoso, quilla transversal patente y una saliente perpendicular poco marcada; apófisis irregular, subpiramidal, algo levantada (casi aplanada en las escamas basales), cúspide aplanada o muy poco saliente, con espina pronto caediza. Semilla obscura, casi ovoide, de unos 5 mm., con ala de 25 mm. de largo por unos 8 de ancho, de color moreno. La madera es blanda, de color blanco; con muy escasa trementina. Se emplea en construcciones y para muebles.

Este pino, quizá incluido por Shaw en el *Pinus pseudostrobus* var. *tenuifolia* (Benth.) Shaw, coincide con éste en la estructura de las hojas, pues el hipodermo forma entrantes, a veces dobles, que llegan al endodermo, pero dichas hojas son gruesas y fuertes, de 25 a 33 cm., tiesas y derechas, en tanto que las del *Pinus tenuifolia* son muy delgadas, flexibles y colgantes. Los conos en lo general coinciden con los del *P. tenuifolia,* pero las apófisis son más gruesas.

Teniendo en cuenta que las hojas no son delgadas, sino por el contrario, gruesas y fuertes, no puede convenirle la denominación de *tenuifolia,* ya que la característica de éste, como claramente lo indica el nombre, es que las hojas son delgadas. El árbol se encuentra en una zona relativamente amplia (desde Sinaloa a Oaxaca).

Por tales razones he visto la conveniencia de considerarlo a parte con rango específico.

Su zona de vegetación, como se ve, comprende Sinaloa, Nayarit, Jalisco, Michoacán, México y Oaxaca (probablemente también Guerrero), formando masas puras. Se le ve asociado con *Pinus Lumholtzii, Pinus leiophylla* y *Pinus oocarpa.*

Se denominó en honor de la Señora Margaret Douglas, dama norteamericana, entusiasta admiradora de la Flora Mexicana, y protectora de los estudios de la misma.

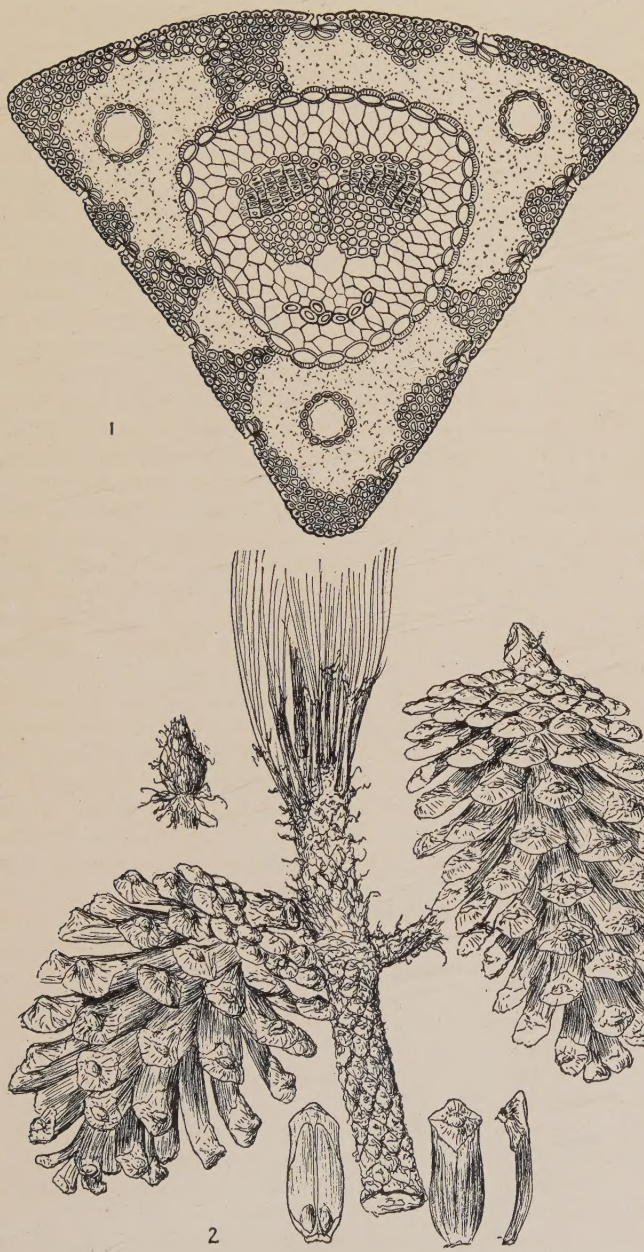

PLATE 1. PINUS DOUGLASIANA. Fig. 1. Sección transversal de la hoja. Fig. 2. Rama y conos. (Dib. de M. Ornelas C.)

Summary

Pinus Douglasiana was perhaps included by Shaw under *P. pseudostrobus* var. *tenuifolia* (Benth.) Shaw, but it differs from this in its longer, stouter, leaves and larger apophyses of the cone scale. It occurs from Sinaloa to Oaxaca. It is named in honor of Mrs. Margaret Douglas.

Morelia 61, México, D. F.
Mayo de 1942.

AN INVESTIGATION OF THE PRESENCE OF SILICEOUS RODS IN THE SECONDARY WALL OF WOODY TISSUE[1]

Walter M. Schall

In 1920, Forrest B. H. Brown (3) proposed an explanation of differential wood shrinkage by stating that a skeleton of siliceous rods existed within the secondary wall of wood elements. He assumed that these rods, acting as a restraining framework, kept longitudinal shrinkage at a minimum. Since the presentation of this explanation, many workers in cell wall structure (6, 7, 12) have referred to this siliceous skeleton or have tacitly assumed its presence, notwithstanding the fact that the micelle theory advanced by Nägeli (13) in 1863 and substantiated by subsequent workers (1, 2, 7, 11, 12, 17) is now generally accepted as the logical explanation for the shrinkage behavior of wood. The present study was undertaken not to explain the mechanics of shrinkage but rather to investigate the procedure employed by Brown (3), first to check his results and second, if similar results could be obtained, to interpret them in the light of the accepted theories regarding wood shrinkage.

The author wishes to give acknowledgment and thanks to Dr. R. A. Cockrell for his interest and suggestions, both in conducting the investigation and writing the final manuscript.

In repeating Brown's (3) work, the following species of wood were used: *Swietenia mahogoni, Trochodendron aralioides, Quercus alba, Cedrela* sp., *Pinus strobus,* and a lapachol-forming species of *Tecoma. Tecoma,* according to Record (15, p. 532), is divided into four groups, "Prima vera," "roble," "ipé peroba," and "lapacho" or "páo d'arco." The "lapacho" group is characterized by having wood that is very "hard and heavy, has an oily olive-brown color, and the vessels are more or less completely filled with yellow crystalline substance (lapachol), which may give the surface the appearance of having been dusted over with sulfur. Ripple marks are always present and usually regular." Lapachol ($C_{15}H_{14}O_3$) "when moistened with ammonia or dilute

[1] Contribution of the Department of Forestry, University of California, Berkeley.

sodium carbonate, turns a deep wine-red, thus providing a reliable diagnostic feature." In order to give comparable results with Brown (3), the results of tests made on *Tecoma* sp. are completely reported although the same tests with comparable results were made on the other material.

If a siliceous skeleton were present in the secondary wall of woody tissue, a change in dimension might take place upon desilicification. To test this, following Brown's (3) procedure, blocks of the foregoing species were placed in hydrofluoric acid to dissolve silica thereby eliminating its reputed restraining effect on shrinkage. In addition, duplicate control blocks were placed in hydrochloric acid which does not dissolve silica but which in other respects should have an effect on the cell wall substance similar to that of hydrofluoric acid. The blocks, ranging in size from one-half to one inch in linear dimension, with true radial, tangential, and longitudinal faces, were measured with a micrometer and placed in boiling water. After five and one-half hours of boiling, during which the blocks were measured at one-half hour intervals, duplicate blocks of each species were immersed in separate solutions of concentrated hydrochloric and 52 per cent hydrofluoric acid. Measurements of the change in dimension were made after eighteen, twenty-three, twenty-eight and thirty-one hours' immersion. After washing in running water for ten hours, and measuring again, the blocks were placed in an oven at 103° C. to remove the excess moisture. The moist blocks were then allowed to air-dry for eight days. Since the swelling values for each of the species followed the same general trend, only the values for *Tecoma* sp. are included. These are recorded in Table I.

In order to supplement the block measurements, individual fibers obtained by maceration with concentrated nitric acid and potassium chlorate (4) were treated with both hydrofluoric and hydrochloric acid. The fibers were mounted in alcohol and measured both in length and width under the microscope. The alcohol was then allowed to evaporate and the acid was added. In no case did the fiber length change after contact with either acid for an hour. If silica in the form of rods was present, the time in hydrofluoric acid was sufficient to dissolve the silica from the fiber. Since no measurable change was observed, it must be concluded that the acids did not remove the restraining force holding the fiber cell wall together, and the cell wall must have been fully swollen before the acids were added.

The effect of chemical treatment on the physical characteristics of the wood was marked. In several cases the blocks showed a decided tendency to check and some even showed some collapse. These same blocks were brittle and a slight pressure on any of the faces caused splitting that took place tangentially along the annual rings as well as radially along the rays. It is not likely that merely drying the wood would cause such extreme stresses to

TABLE I

Percentage Swelling for *Tecoma* sp. in Water and Acid*

	Time	Tangential		Radial		Longitudinal	
Per cent change in boiling water	½ hour	5.4	7.0†	3.6	6.0†	0.8	0.1†
	1 hour	6.0	11.0†	3.9	10.0†	0.8	0.1†
	1½ hours	6.3	12.7†	3.9	11.0†	0.8	0.1†
	2½ hours	6.7	12.7†	4.2	11.0†	0.8	0.1†
	3½ hours	7.0		4.2		1.1	
	4½ hours	7.0	13.0†	4.2	11.0†	1.1	0.1†
	5½ hours	7.1		4.2		1.1	
Per cent change in concentrated hydrochloric acid at room temperature	18½ hours	12.2		7.3		0.3	
	23 hours	12.8		7.6		0.3	
	28 hours	12.8		7.5		0.3	
	31 hours	12.8		7.3		0.3	
Per cent change at air dry moisture content	8 days	−4.7		−4.3		0.1	
Per cent change in 52 per cent hydrofluoric acid at room temperature	16 hours	8.2	15.0†	4.4	11.0†	0.5	0.1†
	20½ hours	7.7	85.0†	4.6	43.0†	0.5	−18.0†
	27½ hours	7.5	57.0†	4.4	29.0†	0.3	−22.0†
	30½ hours	7.5		4.3		0.4	
Per cent change at air dry moisture content	8 days	0.1	−13.8†	2.2	−19.0†	0.0	−40.0†

* Values represent averages for at least four determinations. Negative values represent shrinkage.

† Results as obtained by Brown (3) for similar treatment.

be set up but it is probable that the splitting action was caused by a material weakening of the cell wall by chemical action. These checked blocks were disregarded and only apparently sound blocks were used for measurement.

In determining the air-dry moisture content before and after acid treatment, it was found that the hygroscopicity had decreased. After treatment with hydrochloric acid, the moisture content of the blocks was reduced to three-fourths of the original value and after treatment with hydrofluoric acid to one-third. Again, this would indicate that the acids caused a chemical and physical change in the minute structure of the cell wall so that its original equilibrium moisture content was significantly reduced.

Each of the untreated blocks was sectioned on a microtome, using a jet of a steam to soften the woody tissue. The sections, mounted in water, were examined at 1300 diameters under a Zeiss binocular microscope equipped with an oil immersion apochromatic objective (N.A. 1.3) and 10× compensating eyepieces. Likewise, sections mounted in glycerine were examined and even after contact with the liquid for twelve hours, in no case was there any indication that small isolated areas, supposedly the cut ends

of siliceous rods, were present. The photomicrograph of a cross section of *Tecoma* sp. (fig. 1) taken at 810 diameters shows no discontinuities in the cell wall.

The index of refraction of the cell wall, as found by Brown (3), was verified using McLean's Solution (4) of known indices on cross sections of *Tecoma* sp. Since the index of refraction of the secondary wall and silica are practically the same, the proximity of the two indices may have obscured any possible difference due to the presence of silica.

Fig. 1. Transverse section of a lapachol-forming species of *Tecoma*. ×810.

Both the cross sections and the individual fibers of *Tecoma* sp. were incinerated to see if visual evidence of the rods could be found during the course of incineration or in the ash. Individual cells were isolated from a section 14 microns thick and incinerated over an alcohol flame. The heating time was lengthened for successive sections so that examination could be made at varying degrees of incineration. Under the microscope, the ash showed irregularities but no regular arrangement of bodies was noted. According to Uber (19), these irregularities are probably a result of a natural tendency of the ash to check upon shrinkage. Macerated fibers were incinerated the same way but again no visual evidence of the localization of silica was obtained.

In addition to determining the effect of the presence of a siliceous skeleton on the shrinking and swelling of wood, the actual amount of silica present was determined. Following Brown's (3) procedure, this determination was carried out in two steps. The first was to determine the ash content and the second to determine the per cent silica in the ash. An oven-dry sample of *Tecoma* sp. was accurately weighed and ashed in an electric muffle at moderate red heat. The weight of ash thus obtained was 0.25 per cent of the dry weight of wood. A silica determination based on the weight of ash was made using hydrochloric and perchloric acid in the quantitative analysis (9). The weight of

silica thus obtained gave an average of 0.85 per cent of the dry weight of ash.

The values obtained for ash and silica content are considerably below those given by Brown (3). He states that, "after combustion, 1.8 per cent (of the dry weight of the fiber) of mineral matter was obtained and 0.1 per cent (of the dry weight of the fiber) of silica or silicic acid." These percentages are of little value since they are based on the dry weight of fiber which can be obtained only arbitrarily. The maceration procedure is extremely variable since neither the time nor the temperature of reaction is standardized. A trial maceration using concentrated nitric acid and potassium chlorate (15), gave a dry weight of fibers for *Tecoma* sp. equal to 42 per cent of the dry weight of wood. Based on the dry weight of fibers, this would give values for ash and silica content approximately twice as large as results based on the dry weight of wood if the assumption was made that all the mineral matter was retained by the macerated material. A comparison of ash and silica content cannot be made with any marked degree of accuracy, however, since within a single tree, the values vary from periphery to pith and from the base to the top of the tree.

It is not outside the realm of possibility that inorganic materials are centralized within certain areas in the cell wall. Kerr and Bailey (11, p. 285) state that "the central layer of normal tracheids, fiber-tracheids, and libriform fibers is composed, in all cases, of a complex and firmly coherent matrix of cellulose with elongated, intercommunicating interstices. Within these interstices more or less 'lignin' and other non-cellulosic constituents may be deposited." Bailey (1) recently states specifically that minerals may be deposited within these interstices. Since the mineral content occupies such a small percentage of the weight of materials within the interstices, it is improbable that silica would be so localized as to form a continuous rod.

In view of these findings, it is not likely that a highly silicified skeleton is present in the secondary wall of woody tissue. The results of swelling tests alone should be conclusive evidence of this fact since several species of wood were used and the blocks treated with two mineral acids, one of which would dissolve silica while each should have similar effects on the cell wall structure. If siliceous rods were present they would certainly have been disintegrated after immersion in 52 per cent hydrofluoric acid for 30 hours. As indicated in Table I, a small increase in size was observed but no appreciable difference was noted between the blocks placed in hydrofluoric acid and those placed in hydrochloric acid. Furthermore, the individual fibers failed to give a measurable change when each of the acids was added. In a schematic drawing of a fiber before and after hydrofluoric acid treatment, Brown (3) indicates that the diameter increases and the length decreases with the acid treatment. He explains the

change by stating that the siliceous rods had been broken, thus freeing the so-called homogeneous substance which could then swell without hindrance. If the cell wall is a homogeneous substance, the fiber should have increased in length and width in the same proportion and an inverse relationship could not have resulted.

The acids probably caused a degradation of both lignin and cellulose as well as attacking any of the minerals in the wood. This is borne out by the mechanical weakening of the wood and by the reduced hygroscopicity. Chamberlain (5) and Sacc (17) state that the action of hydrofluoric acid is to soften wood but they do not point out the manner of softening. Plowman (14) in 1904 stated that the action of hydrofluoric acid was to remove silica and other mineral deposits from the wood. Kerr (10) and Harlow (8) point out that the action of hydrofluoric acid is to attack the cell wall substance and the removal of silica is a secondary operation. Harlow (8) explains the softening action as a degradation of lignin since the treated wood does not respond to the Maulë reaction which is employed as a test for the presence of lignin. Kerr (10), on the other hand, states that the action is due to a degradation of cellulose to hydrocellulose and explains the action by drying other acids into wood in order to soften the woody tissue. Rudiger (16) points out that swelling precedes the dissolution of cellulose in liquid hydrofluoric acid and that the lignin structure of the membranes was destroyed, although the lignin itself did not swell. Forsaith (6) in his explanation of differential swelling of wood with adsorption of water credits the siliceous skeleton as proposed by Brown (3) as exerting an influence in conjunction with the micelle theory as proposed by Nägeli (13). A more recent worker, Maby (12, p. 434), in his explanation of shrinkage and swelling, says, "On the other hand, the longitudinal siliceous strands in the cell wall, noted and described by F. Brown, might be expected to exert a binding effect over dimensional changes in the longitudinal direction."

Schorger (18, p. 9) states, "Nägeli, as a result of his study of the growth of starch grains and the cell wall, concluded that the cell wall consists of ultramicroscopic, crystalline, molecular complexes which he called micellae. By this assumption he was able to explain striation, stratification, swelling, double refraction, and other properties of the cell wall." Subsequent workers have followed this general idea. Bailey (1, 2) points out that the cellulose consists of chains of anhydrous glucose residues which tend to aggregate in a parallel fashion. He also states that the aggregation of chain molecules is not in separate groups but rather a part of a continuous system which is held together by overlapping chain molecules and perforated by intercommunicating spaces. It is probably in these intercommunicating spaces that water is adsorbed and causes the changes in the dimension of wood. The mineral content is also probably localized here but

evidence of a continuous bond between inorganic material of the cell wall has not been found.

Conclusions

1. Silica in the form of continuous siliceous skeletons is not present in the secondary wall of woody tissue.

2. The silica content is such a small percentage of the total weight of wood that it could not have an appreciable effect, greater than other minerals, on the differential swelling or shrinking of wood.

3. Other than bringing about more rapid degradation of the wood substance, hydrofluoric acid is similar to hydrochloric acid in its action on the cell wall.

University of California, Berkeley,
May 28, 1942.

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A NEW CLIFF-ROSE FROM ARIZONA

Thomas H. Kearney

It was noted in a recent publication[1] that an apparently undescribed *Cowania* occurs in western Arizona. The writer is now convinced that this plant merits recognition as a species.

Cowania subintegra sp. nov. Frutex parvus, ramulis adscendentibus-patentibus 30–75 cm. longis, cortice albo-griseo; folia nec viscida nec distincte glanduloso-punctata, integra vel nonnunquam apicem versus 1–2-dentata, usque ad 15 mm. longa et 3 mm. lata, spathulata, apice obtusa, basi attenuata, margine valde revoluta, supra laetevirentia et parce araneosa, subtus dense albo-lanata; ramuli, pedicelli, hypanthium, et calycis lobae tomentosi sine glandulis stipitatis; pedicelli 4–11 mm. longi hypanthium subaequantes vel valde superantes; hypanthium infundibuliforme 5–7 mm. longum; petala ochroleuca.

A straggling shrub with stems up to 75 cm. long, the branches ascending-spreading, the bark pale gray, becoming somewhat shreddy; herbage not viscid; twigs, pedicels, hypanthium tube, and outer face of the calyx lobes whitish tomentose, without stipitate glands; leaves up to 15 mm. long and 3 mm. wide but usually shorter and narrower, mostly 1-veined and entire but occasionally with 1 or 2 subapical rounded teeth, oblanceolate, obtuse at apex, attenuate at base, the margin strongly revolute, thick, minutely and obscurely glandular-punctate, bright green and loosely arachnoid-pubescent over the whole upper surface, the lower surface densely and conspicuously white-lanate; pedicels 4 to 11 mm. long, nearly equaling to much longer than the hypanthium; hypanthium narrowly funnelform, attenuate at base, 5 to 7 mm. long, in anthesis about 3 mm. wide at summit; calyx lobes about 4 mm. long, broadly ovate, rounded at apex and sometimes obscurely apiculate, denticulate-ciliolate, spreading at anthesis, becoming reflexed; petals ochroleucous, about 10 mm. long and 6 mm. in greatest width, rounded and slightly erose (occasionally shallowly cleft) at apex, cuneate at base; stamens about 40, the filaments about 4 mm. long, the anthers 1.25 mm. long, nearly orbicular; pistils 3 to 7, the ovary short-stipitate, densely sericeous, the style 6 to 7 mm. long at anthesis, sericeous on the lower one-half to two-thirds, naked above; achenes about 6 mm. long, narrowly obpyramidal, glabrous except near the apex, the persistent style about 25 mm. long (perhaps longer at full maturity), silky-plumose with long antrorse hairs except the apical portion, this naked, 2 to 3 mm. long.

The type was collected about two miles west of Burro Creek crossing on the road from Wikieup to Hillside, southeastern Mohave County, Arizona, near the Yavapai County line, altitude

[1] Kearney, Thomas H., Peebles, Robert H., and collaborators. Flowering plants and ferns of Arizona. United States Department Agriculture Misc. Publ. 423: 405. 1942.

2,500 feet, April 18, 1941 (*Darrow & Benson 10891*). The species is known only from the type locality, where it had been collected first on April 20, 1938 (*Darrow & Crooks 3*). On both dates of collection, only a few late flowers persisted, but the fruit was not yet fully mature. Dr. Lyman Benson stated (personal communication): "The base of the plant is perhaps as much as one to one and one-half inches thick, but the trunk continues for only a few inches above ground." He also reported: "We found the plant growing in a rather limited area on disintegrated material of a peculiar white rock and associated with a vegetation entirely different from that on surrounding territory. However, although the distribution of the plant was restricted, it was locally abundant."

Cowania subintegra strikingly resembles *C. ericaefolia* Torr. of western Texas in habit, appearance, small stature, and very narrow, mostly entire leaves, but the Texas species has linear, sharply cuspidate leaves not more than 6 millimeters long, stipitate glands on the hypanthium (often also on the pedicels), and darker colored bark.

The flowers and fruit of *C. subintegra* apparently present no characters that are not within the range of variation of *C. Stansburiana* Torr., but that is a much larger and more erect shrub, attaining (exceptionally) a height of seven and one-half meters. The branchlets are more stiffly ascending, the bark reddish brown or dark gray, and the herbage usually very viscid. The leaves are much larger, cuneate-obovate in outline, pinnately veined and deeply 3-cleft with the terminal lobe in turn 3-toothed or 3-cleft, and they are nearly always conspicuously punctate with few large glands. With the single exception, so far as the writer knows, of the specimen noted in the next paragraph, the pedicels and hypanthium are beset with stipitate glands and are not tomentose, or but thinly so.

A collection from near Rye Creek, Gila County, Arizona (*Collom 97* in 1933), has the herbage non-viscid, the leaves minutely and inconspicuously punctate, and the pedicels and hypanthium densely pubescent and lacking stipitate glands. In these characters it resembles *C. subintegra* but in other respects it is not distinguishable from *C. Stansburiana.*

The writer believes that Jepson was justified in reducing *C. Stansburiana* to a variety of *C. mexicana* D. Don (Man. Fl. Pl. Calif. 498. 1925). The diagnostic characters given by Rydberg in his key and descriptions (N. Am. Fl. 22: 415, 416. 1913) are as follows:

C. mexicana: Hypanthium campanulate, abruptly contracted into the pedicel. Glands of the pedicel sessile and often hidden in the tomentum.

C. Stansburiana: Hypanthium funnelform, gradually contracted into the pedicel. Glands of the pedicel stalked.

Standley (Contrib. U. S. Nat. Herb. 23: 326. 1922) mentions also that the leaf lobes are entire in *C. mexicana,* whereas at least

the terminal lobe is cleft or dentate in *C. Stansburiana,* as was pointed out by Torrey in his original description (in Stansb. Expl. Great Salt Lake, 386. 1852). The color character of the bark given by Standley does not hold, many specimens of *C. Stansburiana* from Utah and northern Arizona having brown bark.

The manner in which the several characters are associated in specimens from Mexico and from the United States is shown in Table 1. It is evident that whereas in most of the specimens the

TABLE 1. Association of characters in specimens of *Cowania* in the United States National Herbarium that have been referred, respectively, to *C. mexicana* and *C. Stansburiana.*

Species and collection	Primary leaf lobes		Hypanthium		Stipitate glands on hypanthium, etc.	
	Entire	Toothed or cleft	Campanulate, ± abruptly contracted at base	Funnelform, attenuate at base	Present	Absent
C. mexicana						
Rose 11659, Cusihuiriachic, Chih.	X		X			X
E. Palmer 12, Tepehuanes, Dur.	X			X		X
E. Palmer 71, Papasquiaro, Dur.	X		X			X
E. Palmer 4669, Papasquiaro, Dur.	X		X			X
Dugès in 1899, mountains, Guanajuato	X		—	—	—	—
C. Stansburiana						
Most specimens from Utah, Arizona, etc.		X		X	X	
Hartman 276, Naçori, Son.		X		X	X	
M. E. Jones 5586c, Provo, Utah		X	X		X	
V. Bailey 1457, near St. John's, Ariz.		X	X		X	
Knowlton 238, Grand Canyon, Ariz.		X	X		X	
Collom 97, Rye Creek, Ariz.		X		X		X

characters considered by Rydberg and by Standley to be diagnostic of *C. mexicana* and *C. Stansburiana,* respectively, tend to be associated as indicated by them, there are several marked exceptions. Thus two of the five specimens referred to *C. mexicana* have the hypanthium funnelform or intermediate,[2] rather than

[2] D. Don, in his description of the genus *Cowania,* based solely upon *C. mexicana* (Trans. Linn. Soc. London 14: 575. 1825), states: "calyx [hypanthium] obturbinatus basi attenuata tubulosus." His illustration (Tab. XXII), however, shows the hypanthium as campanulate and abruptly contracted.

campanulate, and three specimens from Utah and Arizona that are *C. Stansburiana* in all other characters have a campanulate hypanthium that is abruptly contracted at base. One of the Mexican specimens (*Dugès* in 1899) that has the entire primary leaf lobes of *C. mexicana,* is intermediate in shape of the hypanthium and the latter is conspicuously glandular, although the glands are sessile or nearly so. The specimen from Rye Creek, Arizona, as was noted in a preceding paragraph, although conforming to the characterization of *C. Stansburiana* in shape of the leaves and of the hypanthium, lacks the stipitate glands. It is also aberrant in having the leaves obscurely and minutely punctate, not conspicuously and coarsely so, as in all other specimens of *C. Stansburiana* and in all specimens of *C. mexicana* examined by the writer.

Bureau of Plant Industry,
United States Department of Agriculture,
Washington, D. C.
June 27, 1942.

FRANCESCO FRANCESCHI

John M. Tucker

This paper is a brief account of the life and work of the man who stands out above all others in the history of horticulture in southern California—Dr. Emanuele Orazio Fenzi, known to his associates in this country in later life as Dr. Francesco Franceschi. In gathering data I drew upon a number of sources, and take this opportunity to express my appreciation to the following persons for the assistance they have given me: to Dr. Emily O. Lamb, who lived with the Fenzis at Santa Barbara as a member of the family for fourteen years, to Mr. Peter Riedel and to Mr. H. M. Butterfield, for much of the information contained in the following pages; to Mr. Butterfield, Miss Annetta Carter, and Mr. M. Van Rensselaer, for the loan of horticultural catalogues and journals —sources of much valuable data; to Dr. H. L. Mason, for placing at my disposal a collection of Franceschi's business correspondence (a fund of information of which I have scarcely scratched the surface), and to Dr. Howard S. Reed, for guiding my efforts in preparing this paper. Particularly informative also, were the following two articles: "Una gloria dell'orticoltura italiana. Il Dott. Emanuele Orazio Fenzi," by Mario Calvino—(L'Agricoltura Coloniale, 22: 122–128. 1928.) and "Dr. Fenzi's Contributions to American Horticulture," by F. W. Popenoe (Journ. Hered. 13: 215–220. 1922.).

Emanuele Orazio Fenzi was born March 12, 1843, in Florence, Italy. His grandfather was a very wealthy banker of that city and a senator, a man of an aggressive dominating personality. The Fenzi family were patrons of the arts and sciences, and followed the latest developments in these fields with great interest.

The renowned pianist, Anton Rubinstein, was a friend of the family, and on his visits to Florence, used to come to their home to practice, because their piano was the finest in the city. Thus, the background of young Fenzi was one of culture and wealth, with its attendant advantages.

In early youth he lost his parents, and his grandfather took it upon himself to see that he was properly educated. The grandfather, seeing his young charge as a future man of affairs, sent him to the University of Pisa to study law. Although he would far rather have studied botany, he complied with his grandfather's wishes and in 1864 received the degree of Doctor of Laws.

After leaving the university, he turned to botanical and horticultural pursuits, despite the fact that his grandfather wanted him to start upon a business career. Endowed with a large estate which made him financially independent, he was able to indulge his tastes as he chose in the years that followed. At his country place near Florence, he formed an arboretum of rare trees, and on the estate of a relative near Rome, he assembled a large collection of plants from countries all over the world. He was the first to introduce bamboos to Italy; *Genista monosperma* was another of his introductions. He did considerable work in the improvement of grape and olive culture in Italy, and frequently contributed horticultural and botanical articles, not only to Italian periodicals, but to the English journal, "The Gardener's Chronicle," as well. Fenzi travelled a great deal, and at one time or another visited all the principal botanical gardens of Europe. In May, 1874, he served as secretary of the International Agricultural Exposition at Florence and edited its catalogue. Shortly thereafter, he became the first secretary of the Royal Tuscan Society of Horticulture, an organization of which he was later president.

His activities in later years were not confined to the fields of horticulture and agriculture, however. When his grandfather died, he took charge of the affairs of the bank and, in addition, managed an estate. He was instrumental in establishing an electric tram line to Fiesole, the first in Italy, and the steam lines at San Casciano and Greve. But he had so little enthusiasm for business, that he soon turned over the management of the bank to a cousin. Then, during the economic crisis of 1889–90 Fenzi was forced to close the bank. In order to settle accounts with its creditors he found it necessary to liquidate virtually everything he owned, so that, finally, he and his family were left with only a very small fraction of their once large fortune.

Because of his losses, he was no longer hampered by a multitude of business matters, and saw a chance to put his interest in plants to work. His ambition was to gather together in one area plants from countries all around the globe. He decided to go to southern California because the climate was well suited to his purpose. So, in 1893, he came to Los Angeles, his wife and fam-

ily remaining in Italy. He was in California six years before they joined him. From a strong feeling of family pride he dropped the surname, Fenzi, lest the stigma of his bank failure follow him to America, and adopted in its place a family name, Franceschi. During the twenty years he spent in California, he was known to all but his intimates, as Dr. Francesco Franceschi. In Los Angeles, he met J. C. Harvey, the elder Mr. Howard, E. D. Sturtevant, and other horticulturists and nurserymen. He remained there only a year, however, before he moved to Santa Barbara where he entered into partnership with C. F. Eaton in raising nursery stock. After a short time, the partnership was dissolved and Franceschi started a nursery business of his own, calling his organization the Southern California Acclimatizing Association.

To obtain new species he wrote to botanical gardens, collectors, and plantsmen in all parts of the world, and soon developed an extensive correspondence. Here the unusual linguistic ability Franceschi possessed stood him in good stead, for he read, wrote and spoke not only his native Italian, but also English, German, French, Spanish, and modern and ancient Hebrew.

Yet his interest was far from being confined to exotics. He was ever on the lookout for any elements of the native flora that might possess striking ornamental qualities. Indeed, in November, 1894, having been in Santa Barbara less than a year, he made a week's trip to Santa Cruz Island, the largest of the Santa Barbara Channel Islands. While there he obtained seeds of several different species which were at that time unknown in the horticultural trade. The most noteworthy of these was *Lyonothamnus floribundus* var. *asplenifolius,* the Santa Cruz Island ironwood. Unable to find any seedlings of this tree, he laboriously dug up a living stump and gathered some seed. With considerable difficulty, he managed to carry his prize back to camp, and on his return to the mainland planted it in his lathhouse in Montecito, a few miles from Santa Barbara. In five or six months it had started to sprout. The next year, when he moved his nursery to Santa Barbara, he transplanted it to his new location where, in a few years, it developed into a fine tree. From the seed, Franceschi obtained several trees, one of which is the fine specimen to be seen today in the grounds of the old botanical garden north of the library, on the campus of the University of California at Berkeley.

He had been in Santa Barbara only a year, when, in 1895, he published a small book entitled, "Santa Barbara Exotic Flora." This book contains a good deal of meteorological and climatic data, and observations on the soil and native flora of the region. It includes notes on the history of plant introduction in the region, and mentions the two oldest introduced trees of the town, *Casimiroa edulis,* the White Sapote, and *Prunus Capuli,* the Capulin Cherry, both natives of Mexico. This volume gives an apparently comprehensive review of the exotic plants then cultivated in

PLATE 2 FRANCESCO FRANCESCHI

Santa Barbara and evidences the keenness of Franceschi's observations, and the breadth of his botanical knowledge.

David Fairchild, in his recent book, "The World Was My Garden," tells of meeting Franceschi at Santa Barbara in 1898. He speaks of Franceschi's enthusiasm in the following words: "Santa Barbara in 1898 was but a simple, small town. Residents of the beautiful hillside villas today would not credit their eyes could they visualize the bare, sparsely settled roads where I drove with Dr. Franceschi. . . . Santa Barbara was so undeveloped that I considered him visionary and over-optimistic. However, he foresaw the future more clearly than I, and lived to see Santa Barbara become a great winter resort containing hundreds of beautiful villas like those on the Riviera." Fairchild, at that time with the United States Bureau of Plant Industry, was impressed with the work Franceschi was doing, and had numerous new plant introductions of the Bureau sent to him from time to time for trial in Santa Barbara.

In 1904 Franceschi acquired forty acres of land on Mission Ridge, at that time a dry, barren hillside entirely outside the bounds of the city. Here he built the house in which he lived until he left Santa Barbara, a place he named "Montarioso." He established another nursery here, and, in order to have an ample water supply, built a small reservoir near the top of the hill. A perusal of his business correspondence leaves one with the impression that he was not blessed with much financial success during the following years. In June, 1904, his propagating house burned and he appears to have been considerably in debt in the months that followed. In 1907 he went into partnership with Mr. Peter Riedel, and incorporated the Southern California Acclimatizing Association, hoping thereby to be relieved of some of the burden of routine business matters. This arrangement did not work out well, however, and after little more than a year, in 1909, they decided to dissolve their partnership. Following this incident, Franceschi continued his business independently on Mission Ridge, calling it the Montarioso Nursery. By offering his services in landscaping and maintenance of the grounds of a number of estates in Montecito, he was able to bolster his income. However, the continued cost of introducing new plants, a work Franceschi carried on despite his reverses, and the limited demand for his exotic rarities, made financial disaster inevitable.

It is not surprising, therefore, that upon receiving an offer from the Italian government in 1912, to take a post in the African colony of Libya, he decided to accept. He was to introduce new plants having agricultural and horticultural value, and to do what he could to develop agriculture in the colony, the government furnishing the land and facilities for his introduction grounds. Accordingly, on July 21, 1913, he bade farewell to Santa Barbara, and with his wife and daughters, started out for his native Italy.

His two sons remained in California, the older carrying on the business as manager of the Montarioso Nursery. For the next year and a half, Franceschi lived in seclusion on the Italian Riviera, preparing the manuscript of a book, "Frutti Tropicali e Semi-Tropicali," which was published at Florence in 1915. A short time later, he made a reconnaisance trip to Libya, accompanied by his nephew, Guido Corsini, and in February, 1915, laid out his establishment in the city of Tripoli. Thus, at an age when most men would have been long since retired, Franceschi, at 72, was setting out on a fresh venture. He held this post for several years, and then retired to carry on the same work at his own expense.

In 1922, he was awarded the third Meyer Memorial Medal by the council of the American Genetic Association. This is a medal presented periodically to persons who have accomplished outstanding work in introducing plants to American horticulture. The medal was sent to Tripoli, in 1923, by the governor, Count Volpi.

Franceschi continued his literary activity to the end of his life, contributing articles on agriculture in Tripoli to the Italian journal, "L'Agricoltura Coloniale." He died in Tripoli on November 5, 1924, at the age of 81. Franceschi's oldest daughter has carried on his work in Tripoli, and today maintains a successful nursery there. She, apparently, had, in addition to a deep interest in things botanical, considerable business acumen. Probably the most important accomplishment of the two in Tripoli, has been the importation and propagation of large numbers of eucalyptus trees of various species.

Horticultural Achievements

During the years that he lived in Santa Barbara, Franceschi wrote numerous articles for the local newspaper, and was a regular contributor to such journals as "Pacific Garden" and "Rural Californian." He did much toward developing an appreciation of the beauty as well as the economic value of the large number of ornamental plants and tropical and subtropical fruits that could be grown in the region. His reputation spread throughout horticultural circles in this country, and every botanist or plantsman who visited Santa Barbara, was certain to pay him a call to see his collection of rare plants. The esteem in which his judgment and opinions were held is shown by the frequency with which he is quoted in the literature of tropical and subtropical plants.

Among the multitude of new plants that he brought to the gardens of Santa Barbara, the following are some best suited to the climate there. A number of these have attained the popularity they deserve, although some, none the less fine ornamentals, are still rather rare.

Acacia obliqua
Acacia podalyriaefolia
Aglaia odorata
Aleurites Fordii
Alöe Salm-Dyckiana
Anthyllis Barba-Jovis
Asparagus decumbens
Asparagus scandens var. deflexus
Bauhinia grandiflora
Bauhinia tomentosa
Bauhinia variegata
Benthamia fragifera
Bocconia frutescens
Buddleia madagascariensis
Carica quercifolia
Convolvulus florida
Dioclea glycinoides
Dombeya natalensis
Dombeya punctata
Erythrina tomentosa
Eugenia edulis
Feijoa Sellowiana
Ficus altissima
Ficus infectoria
Ficus retusa
Genista monosperma
Harpephyllum caffrum
Hibiscus heterophyllus
Jasminum simplicifolium
Lippia repens
Lithraea Gilliesii
Lyonothamnus floribundus var. asplenifolius
Metrosideros tomentosum
Myoporum acuminatum
Myoporum tomentosum
Pithecoctenium clematidium
Pithecoctenium muricatum
Pittosporum heterophyllum
Pittosporum rhombifolium
Pittosporum viridiflorum
Psidium lucidum
Rhynchosia minima
Schinus terebinthifolius
Schotia latifolia
Solanum Guatemalense
Sterculia discolor
Stigmaphyllon littorale
Taxodium mucronatum
Tecoma garrocha
Tipuana speciosa
Tricuspidaria dependens
Vitis capensis

Of all the new plants Franceschi introduced, none has become better known than *Lippia repens*. Its popularity is probably due in large part to the publicity given it by Franceschi, but the importance he attached to this particular introduction appears to have been based on an erroneous idea that he held. In 1904, in an article that he wrote for the Los Angeles Times, Franceschi states that he first introduced this species from Italy in 1898. He says: "From the Director of the Botanic Garden in Rome I obtained by mail a small tin box of *Lippia* plants, less than 12 ounces weight. Now, after six years, there are hundreds and hundreds of acres planted with *Lippia* between California, Arizona, Mexico and Australia, and it all came out of that small tin box. . . ."

In contrast to this remarkable statement, H. N. Moldenke, an authority on the Verbenaceae, in a personal communication of May 26, 1941, makes the following comment: "You can be very sure that the plants (of *"Lippia repens"*) of Texas, New Mexico, and Arizona, and central, eastern, and southern United States have nothing to do with the plants introduced into California by Franceschi, but it is my belief that most of those of southern California (at least all that I have seen so far) are descendants of the ones he introduced."

The efforts Franceschi made to secure new plants, to make certain of their identity, and to obtain accurate information regarding their culture and optimum growth conditions, were often great, and show a truly scientific spirit. Scattered throughout his correspondence are letters to and from such well-known botanists as Joseph Burtt-Davy, William Trelease, J. H. Maiden of Australia, Charles Sprague Sargent, Harvey Monroe Hall, Miss Alice Eastwood, and T. S. Brandegee, requesting and receiving identifications of specimens which he had submitted. As another illustration, his letter of October 30, 1908, to Mr. C. Wercklé at San Jose de Costa Rica, might be cited. Wercklé was the discoverer of *Hidalgoa Wercklei,* the "Climbing Dahlia," which Franceschi had introduced at Santa Barbara. Having had difficulty in bringing it to flower, we find him, in this letter, requesting information regarding its mode of growth and climatic requirements from the man who, logically, would know most about such matters—its discoverer. This thoroughness was typical of Franceschi.

A good example of his persistence and determination in effecting the introduction of a desirable species, is the case of *Taxodium mucronatum,* the "Montezuma Cypress." Franceschi had often seen the tree in the Botanic Garden at Naples, planted by Tenore, the botanist who described the species, and its beauty had made a lasting impression upon him. In 1898 he decided to obtain seeds and try it out in Santa Barbara, and accordingly, sent to Naples for seed, which failed to germinate. Year after year, seeds from there and elsewhere persistently refused to germinate, but at last, in 1908, after ten years of failure, his patience was rewarded. Through his friend, Professor C. Conzatti of Oaxaca, he obtained, from the Federal Park at Chapultepec, Mexico, seeds which, much to his gratification, germinated successfully. Today, many fine trees grown from these seeds may be seen in the parks and gardens of Santa Barbara.

The culture of tropical and subtropical table fruits was a subject of special interest to Franceschi. He carried on much correspondence on aspects of this subject with men of the United States Bureau of Plant Industry, and horticulturists and fruit growers (the Popenoes of Altadena, California, particularly), throughout the warmer parts of this country and of many foreign countries. He introduced several new species of *Anona,* and from a superior tree of *A. Cherimola* growing in Altadena, he raised plants in 1910 which he subsequently sent out under the name of *A. Cherimola mammillaris.* His best known fruit introduction was the "Pineapple Guava," *Feijoa Sellowiana.* This he introduced in 1901, obtaining seeds from France, where it had been introduced previously from its native South America. Although it was given much publicity at the time, *Feijoa* has not gained the popularity that Franceschi had hoped for it, and certainly has not attained any economic importance as a fruit in southern California.

Of much greater consequence in this field, however, were the frequent articles he wrote for newspapers and horticultural journals. His book, "Frutti Tropicali e Semi-tropicali," probably embodies the findings of his long years of experience in this field. It is a work of some 260 pages, contains numerous illustrations, and descriptions of 727 species. The majority of these descriptions are rather brief, although for those which are of more economic importance he gives much more detailed information. An English translation of this book from the Italian would be a real contribution to the literature of subtropical horticulture in this country.

The total number of different kinds of plants that Franceschi grew during his stay in Santa Barbara has not yet been fully worked out. Among the miscellaneous papers in the collection of his business correspondence, stored at the Herbarium of the University of California, is a typewritten list of plant names, contained on 114 sheets, with the following inscription pencilled on the first sheet: "List of Seeds and Plants Tried Out in Santa Barbara, California, by Dr. F. Franceschi." The number of genera is approximately 796, of species, varieties, and horticultural forms, approximately 2,129. Exactly what significance may be attached to this list is a questionable matter, however. There is nothing to indicate who compiled it or when this was done. It appears to have been prepared without the exercise of very much care, and in no case is information given as to the results of the trial introductions.

The total number of his new plant introductions is a debatable matter. In the catalogues of the Southern California Acclimatizing Association which he published at irregular intervals, and later, in the price lists of the Montarioso Nursery, he points out the plants that he claims were first offered by him in the horticultural trade in this country. The total number of these—species, varieties, and horticultural forms—mentioned in his catalogues and price lists from 1896 to 1914 (see bibliography) reaches nearly 900.

These claims, however, cannot all be accepted at their face value. There are occasional instances where species that he claimed to have introduced ("plants first offered by us in the United States") can be shown actually to have been offered by nurserymen prior to his coming to California. A single example is *Phoenix canariensis,* the "Canary Island Date Palm." Franceschi, in his "Condensed Catalogue and Price List" for 1908, indicates that this species was one of his introductions, but, according to Mr. H. M. Butterfield this palm was offered by John Rock at San Jose as early as 1877. Moreover, the lack of consistency with regard to some of his claims, in catalogues of different years, casts a shadow of doubt on their validity. For instance, in his catalogue for 1908, he claims to have been the first in this country to

offer the following species (among numerous others): *Cinnamomum Camphora, Euphorbia pulcherrima, Leucadendron argenteum, Magnolia grandiflora,* and *Persea gratissima.* In his catalogues for the years 1896, 1897, and 1900, however, he does not make this claim for any of these species, although they are all listed. However, the number of errors of this sort is probably small, although a careful check of his catalogues against earlier horticultural literature is necessary before their extent can be ascertained.

After making due allowance for these errors, the remainder is still truly remarkable. F. W. Popenoe, said of his work (Journal of Heredity, 13: 215, 1922) "His introductions are more numerous than those of any one man (in the United States), and many of them are now widely grown in the land of their adoption."

No evaluation of Dr. Franceschi's contributions to horticulture in this country would be complete without a consideration of the influence of his personality on those of his contemporaries with whom he came in contact. His wealth of horticultural and botanical knowledge, gained from years of travel, observation, and practical work, coupled with his untiring interest in plants, were a constant source of inspiration to plant lovers wherever he went.

The plants he introduced stand as living reminders of his untiring work, and his memory will long be perpetuated at Santa Barbara in his old home, "Montarioso," which today is a city park, named in his honor, "Franceschi Park."

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May, 1941.

REVIEWS

Ceanothus. Part I. Ceanothus for Gardens, Parks and Roadsides, by MAUNSELL VAN RENSSELAER. *Part II. A Systematic Study of Ceanothus,* by HOWARD E. MCMINN. Pp. xii + 308. A Publication of the Santa Barbara Botanic Garden, Santa Barbara, California. Gillick Press, Berkeley, California. 1942. $2.50.

If there is anyone who admits the place of decorative plants in the general scheme of things but thinks that botanists—above all taxonomists and their tools, herbaria and botanical gardens—have little or "nothing to do with the case," may he be given a copy of "Ceanothus"!

And may it be opened at the preface which, as G. B. S. long ago maintained is apt to be the most important part of a book. William Lassiter, Major General, United States Army, Retired, has written this one which not only reviews the work and outlines its purpose but places anyone who has anything to do with ornamental plants in the mood to desire greater use, understanding and appreciation of them.

The book is divided into two parts: the first by Van Rensselaer is devoted to a consideration of the species, alphabetically arranged, known in cultivation; the second, by McMinn is a

detailed taxonomic account of the entire genus. The former is followed by an evidently carefully considered exposition of the propagation and cultivation of these shrubs prepared by A. J. Stewart, Horticulturist of the Santa Barbara Botanical Garden, and the latter by a chapter of twenty-odd pages, entitled "Distributional History and Fossil Record of Ceanothus," by Herbert L. Mason. Even those primarily interested in the living plants will read Dr. Mason's lucid account of the probable evolution of the group and its species with interest because he gives a glimpse of the relationship of old floras with those of today, and by his thoughtfully interpreted observations throws light on the probable development of a number of the forms treated with doubt as distinct entities.

McMinn precedes his key to the fifty-five species and about half as many varieties (and the descriptive text) by a "General Discussion"; incidentally this includes the formal description of the genus. The discussion itself comprises about ten pages not counting some twenty more occupied by distributional maps, probable relationship charts, natural hybrid charts, chromosome "pictures" and a list of the specimens from which they were drawn (this commendable). There is also a plate depicting well the two sections into which the genus is readily divisible. The seven distributional maps are clear and conveniently show on each one several species and their variants. With the aid of these various charts the author explains, apparently with considerable confidence, his taxonomic conclusions and his reasons for arriving at them. The reviewer has no knowledge of *Ceanothus* whatsoever but anyone with general experience in classification will, it seems to him, have the impression from the author's discussion, and that of Mason, that the taxonomy even with present knowledge could have been on a sounder basis. Perhaps a number of the entities recognized as species of equal merit could have been differently evaluated considering the fact that a simple geographically limited, variable, often solitary character has frequently been accepted as "specific." However the author believes that species can be proved by experiment. Granting that this is so, it is my impression that experimental taxonomic methods, so to speak, have more often proved than disproved the fundamental soundness of specific lines and apparent relationships as they were previously suggested by the more capable botanists of yesterday and entirely from morphological and geographical data. McMinn's interest . . . I almost wrote enthusiasm . . . in "experimental methods" has, I cannot help but sense, inhibited his own expression of what he believes is actually happening (or has happened) in the history of these fascinating and plastic plants. This unfortunately (from the standpoint of practical simplicity) has resulted in his not anticipating facts (as he hints himself, for example page 191 and elsewhere) that the methods he advertises will probably at least in many cases be able to prove. In any

case his keys and remarks are clear, and others can follow his reasoning. His obvious knowledge of the group is little short of amazing even with due appreciation of his indebtedness to the work of previous students, notably Jepson and the latter's pupil, J. T. Howell. To the former he pays the compliment of using his method of citation of references and specimens. In this connection one may remark the excellent, distinctive typography. There is a lovely color plate of *C. purpureus* and innumerable photographs uniformly of exceptional beauty and value as well as a number of good drawings.

Finally let us turn to the descriptive account of the seventy-odd species and a number of varieties distinguished by Van Rensselaer in cultivation. He describes them in the idiom of the horticulturist, usually adding some remarks as to distribution, where cultivated and the growing conditions required. It would have been desirable if, besides the index to the entire book, page references after the descriptions had been given in each part to the other part. In this case some discrepancies in names used for the same plants would have been discovered. For example on page 14 we find the name *C. austromontanus* instead of *C. foliosus* in which it is included by McMinn, page 223. On page 30 the name *C. exaltatus* is given as "a new horticultural designation" while McMinn ignores it except as a variety of *C. gloriosus, et cetera.* Some of these slips, or they may be differences in opinion between the two authors, are going to confuse if not anger bibliographers, not to mention certain professional botanists who, of course, are almost God-like in the perfection of their own work!

Above the rare mistakes, here is a living work, jointly conceived, jointly prepared, inspiring to everyone whether amateur or professional in the garden, herbarium or laboratory, and creating a closer bond of understanding, of friendship between all who have to do with plants, as Major General Lassiter has happily phrased it. The contributors who made the book possible are to be congratulated and thanked for supporting so worthwhile a project that is destined to become a classic of its kind. Humanity needs many similar books and from them will be born the realization that adequately financed herbaria and gardens must always be the basis for them.—J. Francis Macbride, Field Museum of Natural History, Chicago.

Practical Plant Anatomy. By Adriance S. Foster. Pp. 1–155. D. Van Nostrand Company, Inc., New York. 1942. $2.50.

This compact book of fourteen chapters or "Exercises" is spirally bound in flexible fabrikoid. Each exercise consists of a brief but accurate résumé of both early and recent papers dealing with the subject of the chapter, some discussion of the subject matter and different points of view thereon, and suggestions for study of selected materials and drawings to be made by the student. A short but well-chosen bibliography completes each

exercise. The book is primarily a laboratory guide for a course in plant anatomy, although the discussions contain much factual material not usually included in a strictly laboratory guide.

The suggestions for study, the material recommended, and the diagrams and drawings which the student is supposed to make, are all thoughtfully handled. The author has succeeded in reducing the number of drawings required to a minimum, a feature that will be welcomed by the immature students who want to confine their laboratory work to a definite, set period. This feature is not as reprehensible as it might seem to some proponents of many drawings, for *diagrams* are substituted for the tedious, time-consuming detailed drawings to show relationships among various tissues. Of course, any student interested in making numerous detailed drawings of cellular types will find adequate hints throughout the text if he looks for them! The total absence of figures and illustrations mitigate against the use of the book as a guide to a study of plant anatomy by those who are unable to work under the direction of a trained instructor or where the library facilities do not afford extensive reference works.

No attempt was made to give directions for the preparation of permanent microscope slides. But a far better point of view has been taken in that free-hand, temporary mounts of fresh materials are called for in nearly every exercise. No student using this method will get the idea that xylem is always stained red and that phloem and parenchyma cells are characterized by an affinity for a blue or green stain! Brief directions for macerating woody tissues and for the use of a few special reagents are included in the short appendix. The index is gratifyingly complete.

The method of approach is analytical and classificatory rather than phylogenetic. The author's reason for thus avoiding controversy is well stated in the following excerpt from Exercise IV (p. 39): "Since all methods for classifying plant tissues are open to objection, the writer has adopted a non-committal and 'practical' attitude in this book. Instead of following any one scheme of classification, the emphasis is placed first of all upon the salient morphological features of the *principal types of plant cells*. These cell types recur in various regions, 'tissues' and organs of the higher plants, and a thorough knowledge of their form, structure, development, and presumable function(s) must constitute the necessary analytical approach to anatomy."

The format and typography is good and errors are extremely few. The fabrikoid cover helps to protect the book from damage where liquids may be spilled on the laboratory table and the spiral binding permits the book to lie flat when opened to any page. The numerous references in the text and the bibliographies following each exercise hold valuable keys to voluminous literature on plant anatomy.—Ira L. Wiggins, Stanford University.

John Torrey, a Story of North American Botany. By Andrew Denny Rodgers III. Pp. 1–352. Princeton University Press, 1942. $3.75.

Mr. Rogers has included in one volume an amazing wealth of information on the history of botanical exploration in North America. He is to be congratulated on presenting such a comprehensive picture of the life of John Torrey. Torrey, professor of chemistry at Columbia and Princeton, was by avocation a botanist. Through his pioneering efforts, the systematization of the flora of this continent was begun. He arranged and described the collections of numerous individuals and expeditions—Fremont, Emory, Owen, Whipple, Ives, the Mexican Boundary Survey, the United States Exploring Expeditions, and many others. He was founder of the Torrey Herbarium, now housed at the New York Botanical Garden, and of the United States National Herbarium. His influence was extended by his association with the foremost botanists of his time, one of his first proteges being Asa Gray. The large amount of material from original sources which is made generally available for the first time in this book is intensely interesting as well as invaluable to a study of the history of botanical exploration.—Mildred Mathias, Department of Botany, University of California, Berkeley.

Geographical Guide to the Floras of the World. Part I. By S. F. Blake and Alice C. Atwood. United States Department of Agriculture, Miscellaneous Publication 401, pp. 1–336. Washington, D. C. June, 1942. $0.75.

Here is the first part of a catalogue, unique in its field, that is destined to become one of the most useful books in the entire science of botany. Its value has been adequately demonstrated to the reviewer many times during the short time that the book has been in his possession. The work is a bibliographic catalogue listing in geographic order the floras and floristic accounts of the various geographic units of the world. In general, only complete works are included, but for little known regions collector's lists are sometimes cited. Both general and local floras are included and most of the entries are annotated to indicate the content of the work. Part one deals with Africa, Australia, insular areas, North America and South America. To the authors are due the thanks of the entire botanical profession for performing so well a task that doubtless entailed much drudgery.

It is to be hoped that this work may serve as a stimulus to inspire some bibliographically inclined individual to compile and publish a companion volume which will guide students to the literature dealing with taxonomic accounts, in whole or in part, of the families and genera of the flowering plants.—Herbert L. Mason.

Eriocaulaceae, Avicenniaceae, Verbenaceae. By HAROLD N. MOLDENKE, in Flora of Texas, edited by C. L. Lundell. Vol. 3, pt. 1, pp. 1–87. University Press in Dallas. Southern Methodist University. 1942. $1.50.

This is the first part to be published of a proposed ". . . 10-volume work, each volume to contain approximately 700 pages. Volume 1 and 2 will contain the history of botanical exploration, the key to the families, a catalogue of all species, and maps showing distribution according to counties." The proposed work is unlike most modern floras in that each part will be a complete monographic unit in itself and will not, apparently, be arranged in taxonomic sequence by families.

This first part by Dr. Harold N. Moldenke, of the New York Botanical Garden, is notable for the length of the generic and specific descriptions, complete synonomy, citation of numerous specimens, and extensive (probably complete) citation of references to publications where the species have been treated by earlier authors. The number of specimens cited for each family, together with an enumeration of the herbaria where they are deposited, is given in a footnote below each family description.

The keys to genera and species are dichotomous and separate varieties as well as species. In most instances they use qualitative rather than quantitative characters, but sometimes make use of geographic ranges to supplement comparatively weak morphological characters.

Brief but interesting comments deal with vernacular names, geographic ranges, relationships, earlier misidentifications and uses by aborigines and the early settlers.

The paper is of good quality and the printing clean-cut. Typographical errors are few. Both the taxonomic and editorial work seem to have been done thoroughly, although Dr. Moldenke appears to draw specific lines pretty finely.

The publication of this monograph of the three families as they are represented in Texas initiates an ambitious project which will be watched with interest by all plant taxonomists. Dr. Lundell is to be congratulated for undertaking to see through the tedious processes of writing and printing a work that will fill a long felt need—an adequate and exhaustive flora of the Lone Star State. It will be a source of great satisfaction to taxonomists if the high standards established in this initial publication hold throughout the entire work. It is the hope of the reviewer that Dr. Lundell may be able to secure the aid of enough collaborators to push the series through to completion within a reasonable length of time.—IRA L. WIGGINS, Stanford University.